

# Cellular Specialties, Inc.

Co-Pilot Beacons Improve Indoor E911



November 8, 2011



# **CSI Comments**

**in the matter of  
Wireless E911 Location Accuracy Requirements**



# CSI Positions

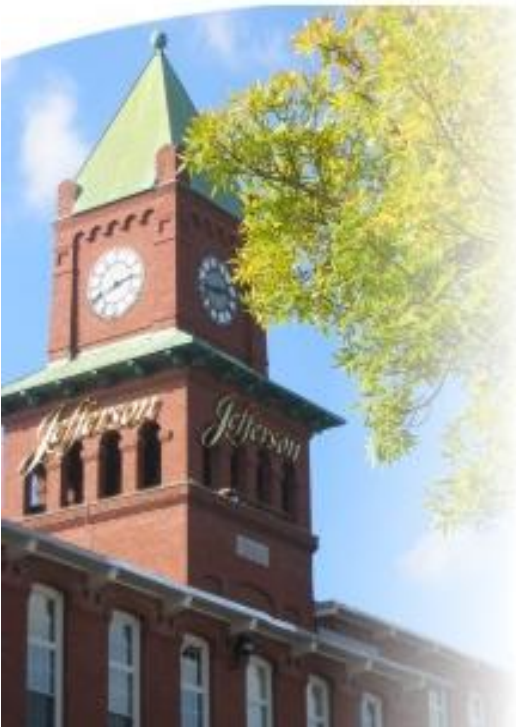
***CSi agrees with the Commission's decision to "refer the indoor testing issue to the CSRIC for further development of technical recommendations." We also agree with the recommendations of CSRIC 4C Report of March 14, 2011, particularly the recommendation "that the FCC should: establish an E9-1-1 Technical Advisory Group to address specific location technology issues for 911, such as how to improve location accuracy in challenging environments;...." and request the Commission establish the suggested Advisory Group immediately. And finally, CSI looks forward to active participation in such ETAG deliberations)...***

In furtherance of that, we're here today to help the Commission understand who we are, our technology, its deployment, the status of various tests/trials, and our technology direction going forward.



# About CSI

- **Founded in 1997**
- **Opened Corporate Offices in Manchester, NH**
- **Market leading solutions and products through its synergistic divisions**
- **North American Tier 1 Carriers use CSI**
- **Two Divisions**
  - Product
  - Custom Solutions Group
- **Over 180 People Nationwide**



# Synergistic Product & Service

**Divisions**  
**Service**  
**Division**

**Product**  
**Division**



## Key Benefits

**Complete Solution Set for  
All Client's Needs**

**Drives Ability to Innovate  
and Product Roadmap**

**Drives Quality  
and Value for Clients**



# CSI Product Division

## Cellular Specialties

14+ Years  
of  
Experience

Innovative  
Products

Nationwide  
Installation  
Services

## Products

Antennas

System  
Components

Digital  
Repeaters/  
Beacons

## Repeaters in LTE Networks

Limit Macro  
Network  
Interference

Improve  
Network  
Capacity

MIMO  
Compatible

# Carrier and Public Safety Product Family

## Digital Repeaters and Bi-directional Amplifiers



- Over 45k signal boosters sold to date
- Leader in Digital Repeater technology
- Repeaters designed and made in the USA
- Wireless Service Provider and Public Safety products available in all spectrum requirements

**CSI Product Family**

## E911 & LBS Enhancement Solutions



- Co-Pilot Beacon Transmitter
- Used for CDMA networks
- Indoor and/or Outdoor Solution
- Ideal for campus environments, large public venues, tunnels, office environments....
- Designed and manufactured in the USA.

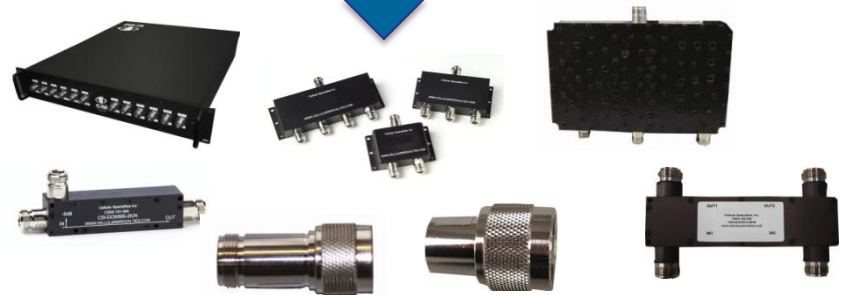
# Carrier and Public Safety Product Family

## Antennas



- Yagi Antennas
- Omnidirectional Antennas
- Panel Antennas
- Corner Reflectors

## System Components



- **NEW** DAS Interface Unit
- Cross Band Couplers
- Splitters
- Combiners
- Terminations
- Attenuators



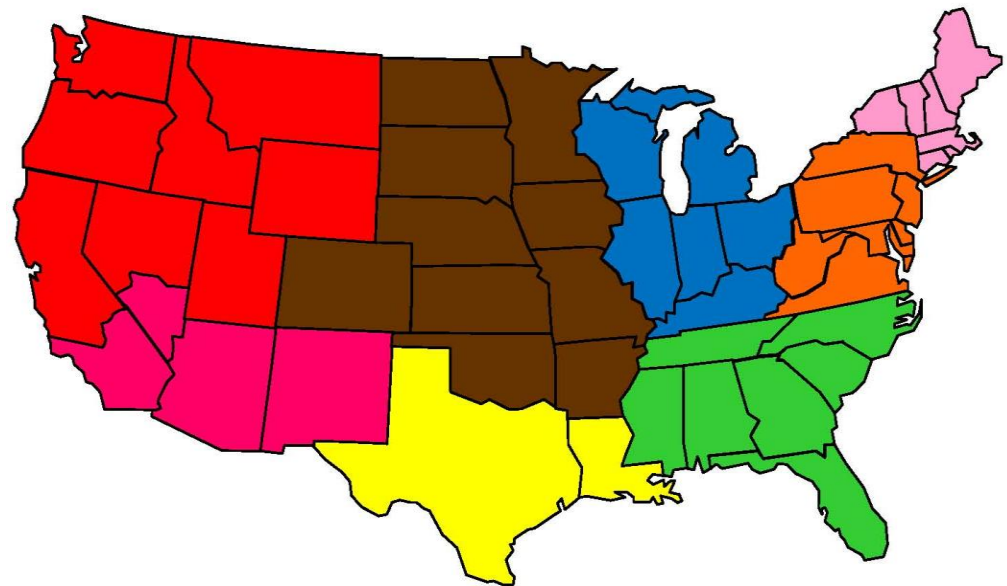


# Custom Solutions Group

- **Over 7,500 Turnkey Solution Deployments**
- **Product-Neutral Approach**
- **Nationwide Systems Integrator**
- **Only solutions provider approved by all major Wireless Service Providers nationwide**
- **Globally-recognized certifications and credentials (CISSP, BICSI/RCDD, CWNA, CISCO, Motorola, etc)**

# Team Approach

- Regional Sales Manager
- Project Coordinators
- Design Engineers
- Project Managers
- CSI Technical Partners
- WiFi Team
- Public Safety Team
- Engineering
- Logistics
- Administration



# Custom Solutions Group

## Pro Services

**RF Design**

**Site Survey**

**Project Management**

**Engineering**

**Implementation**

**Maintenance**

**Monitoring**

## Capabilities

**3G/4G (cellular)**

**Wireless LAN**

**Public Safety**

**Enterprise Solutions**

**Fixed Mobile Convergence**

**Emergency Notification**

**Building Automation**

**And more**

## Industries

**Healthcare**

**Education**

**Retail**

**Public Venues**

**Manufacturing**

**Real Estate**

**Hospitality**

**Government**

**And more**

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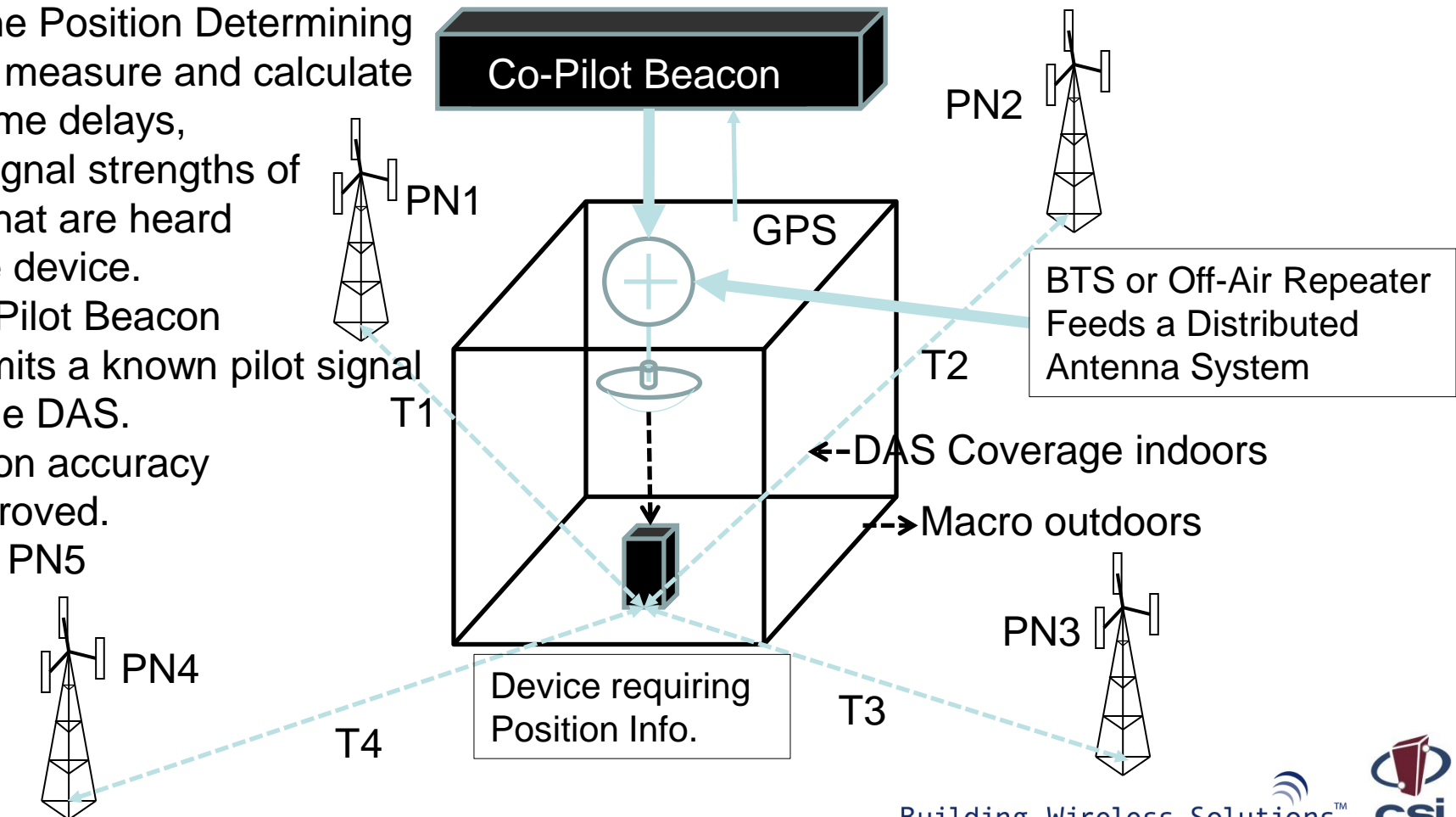


# **Co-Pilot Beacons for Enhanced Indoor E911**

**A present-day solution to accurate  
indoor positioning in CDMA  
networks.**

# What is a Co-Pilot Beacon?

The network, device and the Position Determining Entity measure and calculate the time delays, and signal strengths of PN's that are heard by the device. A Co-Pilot Beacon transmits a known pilot signal into the DAS. Position accuracy is improved.







# Aspects of Co-Pilot Beacons

- CPBs are not proprietary technology.
- CPBs are currently supplied by multiple equipment vendors.
- No change is required to the existing E911 control plane interface standards for operation
- Current/future handset and smart-phone CDMA chipsets are compatible without modification.
- CPB locations are known and entered for accurate positioning, managed as a network element.
- Periodic surveys are not required to ensure beacon location integrity.



# CSI's Accomplishments

*CSi has developed, deployed and tested technology that improves the position accuracy of E911 wireless calls made indoors, particularly CDMA calls made through a Distributed Antenna System.*

*In all scenarios trialed thus far, CSi's CPB technology has improved indoor positioning dramatically, consistently within 50-100 meters of actual position.*

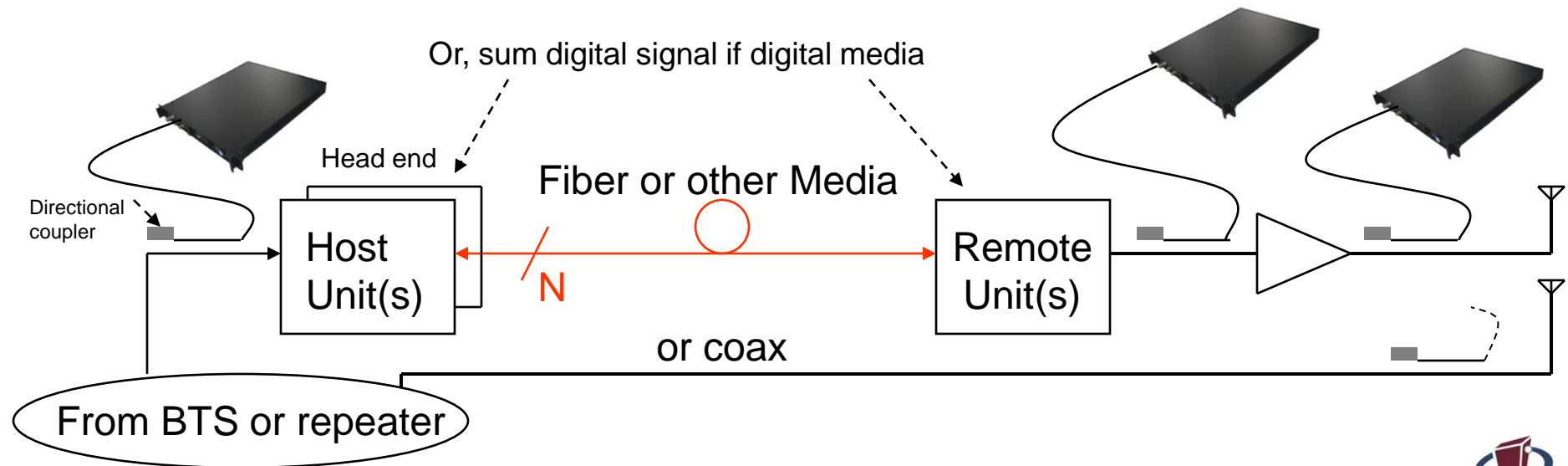



# Co-Pilot Beacon Activities in CSI

- **Multiple projects underway designing Co-Pilot Beacons for E911 improvement indoors:**
  - Rutgers University
  - 2 Large Hospitals in Seattle, WA area
  - Septa Train Stations - investigation
  - UNC – Currently deploying
- **Design and Install Teams are being trained.**
- **R&D for CPB improvement, cost reduction, and increasing ease of deployment.**
- **Investigation of beacons for non-CDMA devices.**

# CPB signals are summed into a Distributed Antenna System

- **How to sum CPB signals into traffic channels**
  - Inject at low power at host or
  - Inject at low power before PA at remote or
  - Inject high power into antenna – not preferred; not as green





# McCarran Airport Situation, Goal, and Solution

Situation: After the McCarran Airport DAS is installed in Concourses A and B, the PSAP will not be able to adequately differentiate between 911 calls made from Concourse A or Concourse B, due to the simul-casting of a sector to both concourses.

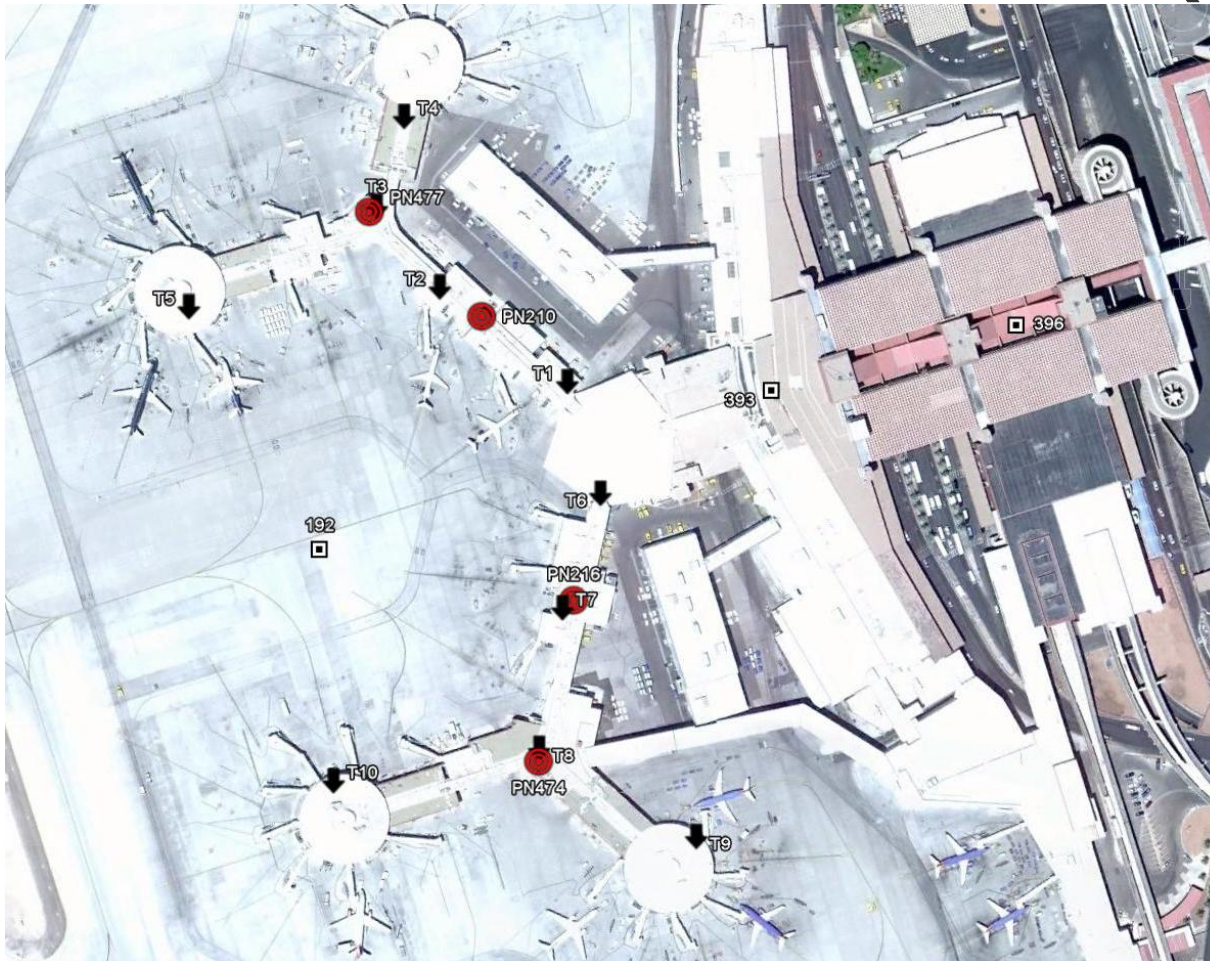
Goal : A First Responder needs to have increased confidence which concourse the call is originating from.

Solution:

Install Co-Pilot Beacons based on the DAS design and the design Goal : identify the concourse with very high certainty.

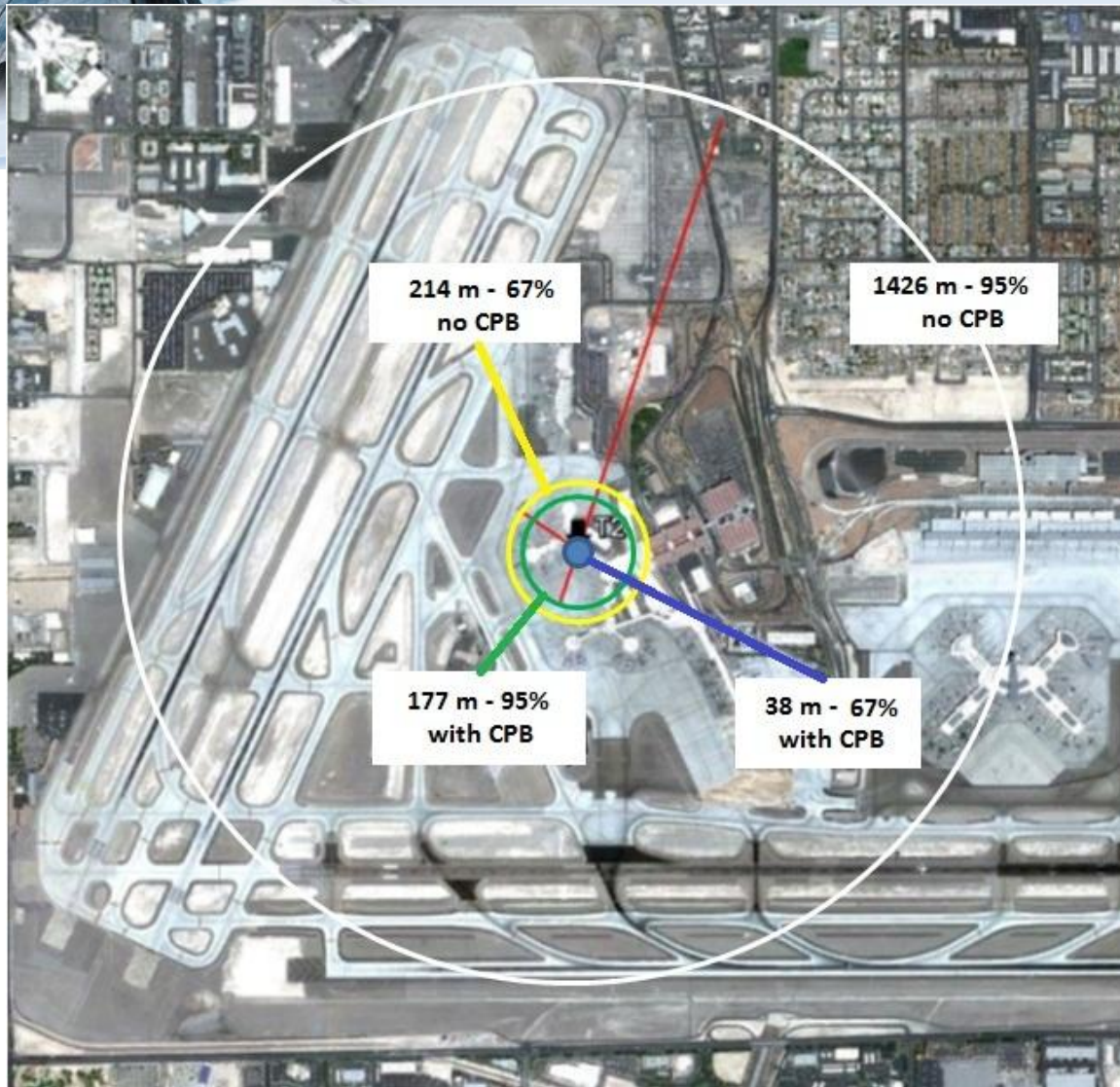


# CPB Design at McCarran Airport: Four Co-Pilot Beacons (red) Ten E911 Test Call Locations (arrows)



# Co-Pilot Beacon Results

McCarran Airport-with BTS-driven **multicast** DAS-  
before CPBs  
And After CPBs



2000 fixes  
from PDE  
Before CPBs:

— 95%

— 67%

2000 fixes  
from PDE  
After CPBs:

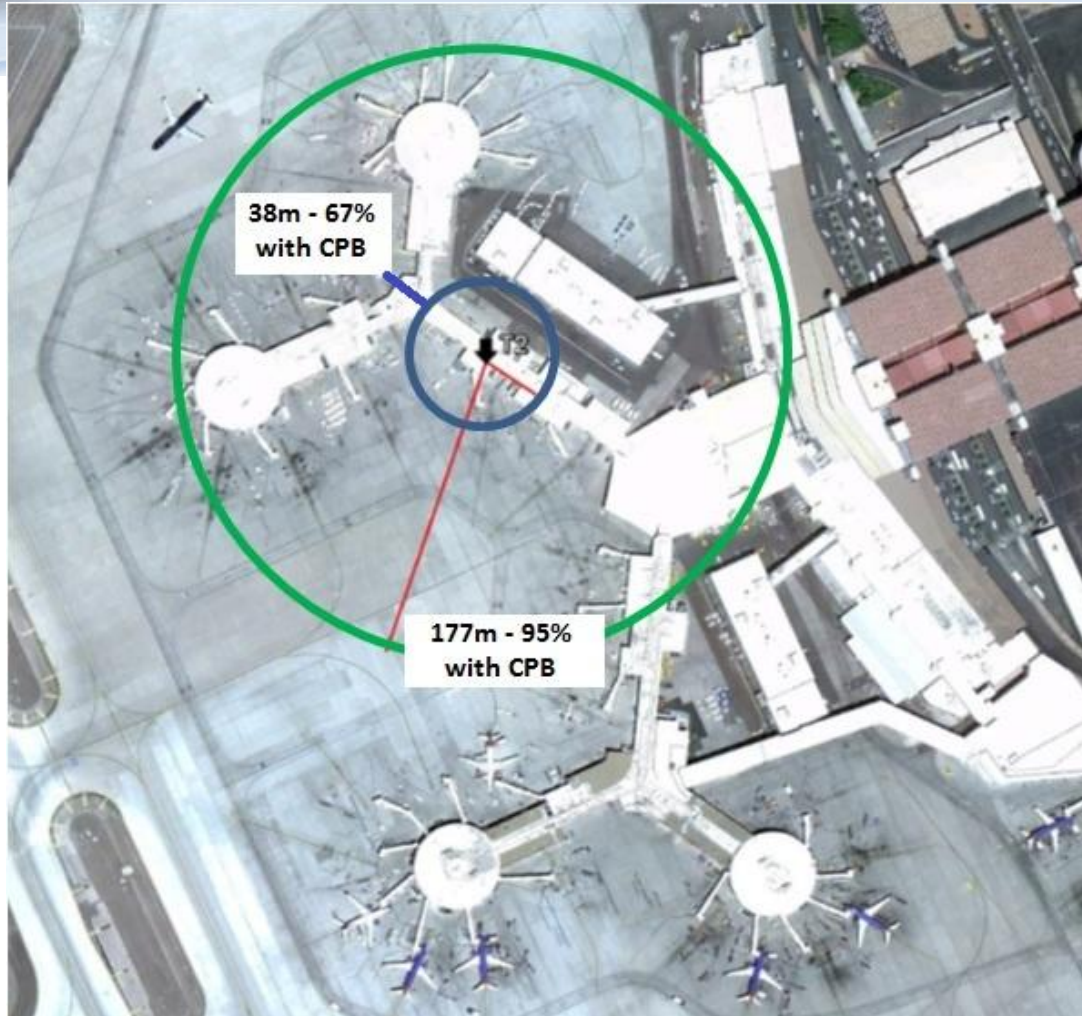
— 95%

— 67%



# Co-Pilot Beacon Results

McCarran Airport-with BTS-driven **multicast** DAS  
**-after CPBs**



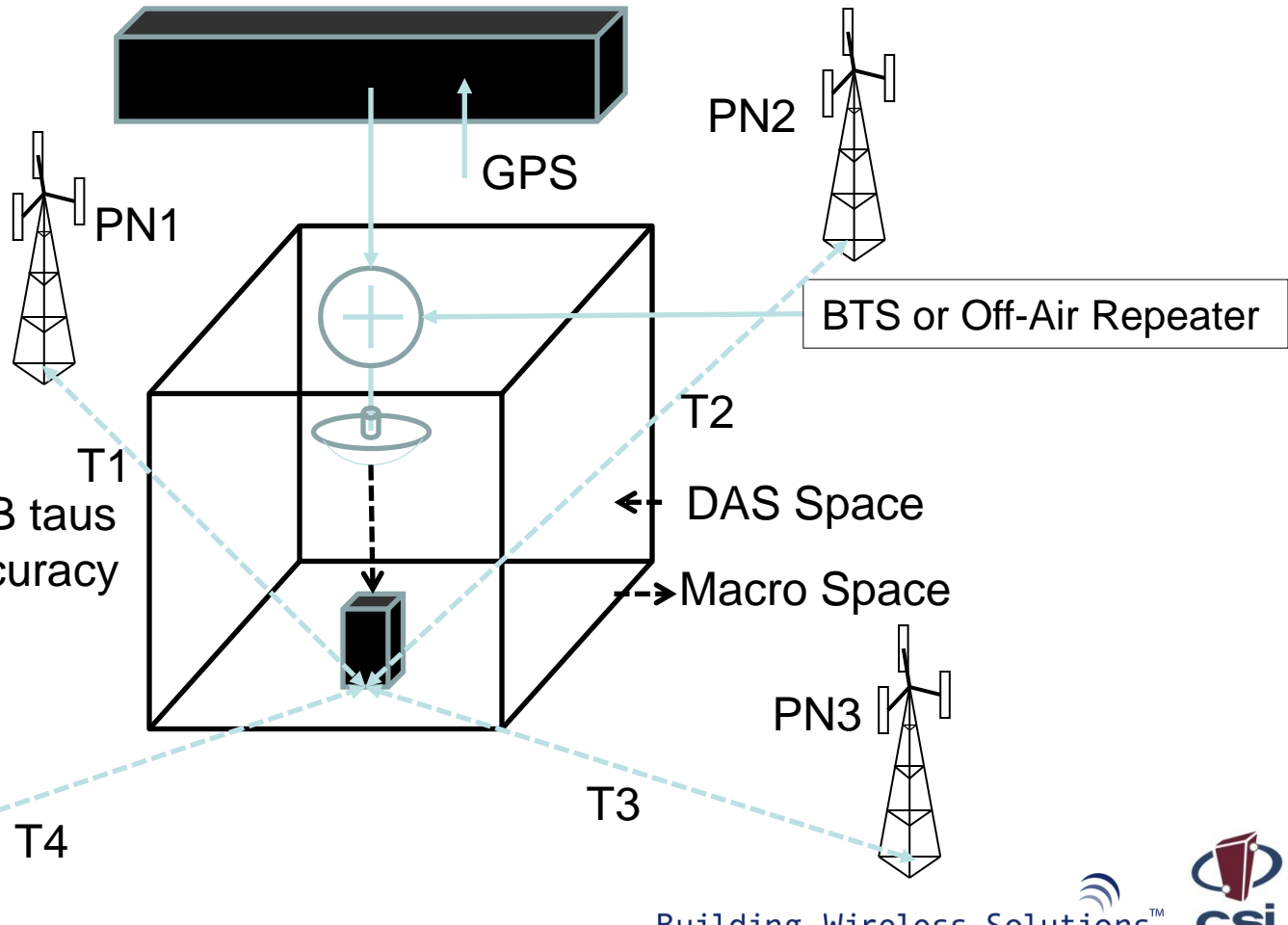
2000 fixes  
from PDE

Average  
of ten locations,  
plotted at  
one location.

# Ongoing work: Multi-PN Co-Pilot Beacons

$\text{Tau\_PN1} = T1$   
 $\text{Tau\_PN2} = T2$   
 $\text{Tau\_PN3} = T3$   
 $\text{Tau\_PN4} = T4$   
 $\text{Tau\_PN5} = T4$   
Etc.

Multi-PN Co-Pilot Beacon or Pilot Beacon



## Benefits:

- No BTS DB entries
- No BSA DB entries
- Moveable fix using CPB taus
- Adjust taus for best accuracy



# Summary

- **CSI has existing and proven solutions, and the teams in place to improve location accuracy when Distributed Antenna Systems are used.**
- **CSI is optimizing products and enhancing the deployment of CDMA and other beacon technology for improved indoor E911.**
- **CSI wishes to participate with others to discuss improvements in E911 performance and reduced costs.**



# Thank You!

## Questions/ comments?

**Scott T. Goodrich**  
**President, Product Division**  
(617) 590-1000  
[sgoodrich@cellularspecialties.com](mailto:sgoodrich@cellularspecialties.com)

**Michael L. Scullin**  
**Principal Telecom Policy Consultant**  
(202) 285-7664  
[mike@scullinconsulting.com](mailto:mike@scullinconsulting.com)

**William J. (Skip) Crilly Jr.**  
**CTO**  
(509) 879-0094  
[scrilly@cellularspecialties.com](mailto:scrilly@cellularspecialties.com)

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# Backup Slides – further detail

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# Co-Pilot Beacon PN augmentation to improve commercial LBS and E911

- **Question: Will E911 be enhanced with commercial systems? If yes, then commercial CPBs enhance E911.**
- **LBS Applications**
  - A device runs an app that needs location:
  - Step 1. Device sends a measurement to a “Position Determining Entity.”
  - Step 2. PDE and Location server replies with handset location.
- **“Position Determining Entities”**
  - Dozens of companies are developing new location databases for commercial applications
  - The technology may or may not use wireless network sourcing.
  - Many databases are “crowd-sourcing” their data.
- **Co-Pilot Beacons can be deployed to improve LBS**